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| Name: | | Start Date: | | | | | | 11/28/16 |  |  |
|  | | Test 4 Date: | | | | | |  |  |  |
| Period: | | Teacher: Ms. J | | | | | | |  |  |
|  | |  | |  | |  |  | |  |  |
| **Cells & Cell Processes** | | Submitted | Resubmit | | Correct | | Evidence of Learning | | Page | Date |
| **Objective 9:** Analyze how cells grow and reproduce in terms of interphase, mitosis, and cytokinesis. | |  |  | |  | | Notes: Why Cells Divide | |  |  |
|  |  | |  | | HW: Cell Reproduction Article | |  |  |
|  |  | |  | | Catalyst 1: Chromatin vs. Chromosome | |  |  |
|  |  | |  | | Lab: Intro to the Cell Cycle | |  |  |
|  |  | |  | | HW: Vocabulary Review | |  |  |
|  |  | |  | | Catalyst 2: TBD | |  |  |
|  |  | |  | | Notes: Mitosis & Cancer | |  |  |
|  |  | |  | | HW: Cell Cycle Coloring WS | |  |  |
|  |  | |  | | Lab: Mitosis Cut & Paste | |  |  |
|  |  | |  | | HW: | |  |  |
|  |  | |  | | Lab: Mitosis Length of Phases | |  |  |

**Catalyst 1:** What is the difference between Chromatin and Chromosome?

**Catalyst 2: TBD**

**Unit 2: Cells & Cell Processes**

Start Date: 11/28/16 Test 4 Date:

**Objective 9:**  Analyze how cells grow and reproduce in terms of interphase, mitosis, and cytokinesis.

*Essential Question:* What is the cell cycle?

*Essential Question:* What is the sequence and function of mitosis?

*“I Can” Statements:*

* Describe/outline the stages of the Cell Cycle: Growth 1, Synthesis, Growth 2, Mitosis, and Cytokinesis
* Organize diagrams of mitotic phases and describe what is occurring throughout the process

**Objective 10:** Explain how genetic and environmental factors can influence the cell cycle and lead to cancer.

*Essential Question:*  What is cancer?

*Essential Questions:* What causes cancer?

*Essential Questions:* How are different cancers caused, treated, and prevented?

*“I Can” Statements:*

* Describe the relationship between mutations in the DNA and uncontrolled cell growth
* Use an example of a specific cancer to illustrate how cancer is caused, treated and prevented

**Objective 11:** Explain how instructions in DNA lead to cell differentiation and result in cells specialized to perform specific functions in multicellular organisms.

*Essential Question:* How do cells become specialized?

*“I Can” Statements:*

* Explain that cells differentiate and give examples of differentiation/specialization
* Describe stem cells as undifferentiated and discuss how this is important to scientific research
* Explain the relationship between DNA expression and the type of cell that develops through differentiation

Biology I Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Notes: Why Cells Divide Period: \_\_\_\_ Date: \_\_\_/\_\_\_/\_\_\_

**Fast Fact:**

A healthy adult human produces \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_new cells every second!

**Why cells divide:**

* There are several reasons why cells divide rather than continuing to grow indefinitely:
  + 1.
  + 2.
  + 3.
  + 4.

**1. DNA Overload**

* Most cells have one \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_that contains the DNA for the cell
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is needed to instruct cell parts to make protein, enzymes, etc.
* As a cell grows, it \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_make more DNA
* This creates an ‘\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_”– a large cell without enough information to tell it what to do

**2. Surface Area-to-Volume Ratio**

* The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_a cell gets, the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ it is to move material across the cell membrane
* Most materials use \_\_\_\_\_\_\_\_\_\_\_\_\_\_to move
* Therefore, metabolism (using/digesting of materials) only occurs as fast as materials can be supplied and eliminated
* Diffusion is very \_\_\_\_\_\_\_\_\_\_\_\_\_over short distances
* Diffusion gets very \_\_\_\_\_\_\_\_\_\_\_\_\_ over longer distances
* As a cell increases in size, both its \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (inside the cell) and the \_\_\_\_\_\_\_\_\_\_\_\_\_\_ (outside the cell) grow, but not proportionately
* As cells grow, \_\_\_\_\_\_\_\_\_\_\_\_\_\_increases faster than\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, therefore, *cells stay small!!*
* This is a problem because the cell wants as much \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_as possible to absorb ‘stuff’

**How do cells stay so small……\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Before cell division happens…**

* The cell \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_its DNA
  + Allows both daughter cells to have all of the DNA information in the parent cell. This solves the information overload crisis.
* Cell division also solves the problem of the surface area-to-volume ratio by allowing your cells to stay \_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

**CHROMOSOMES**

**DNA can appear in two forms:**

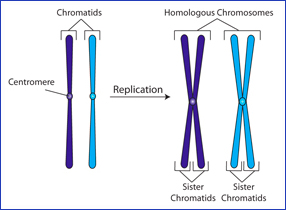
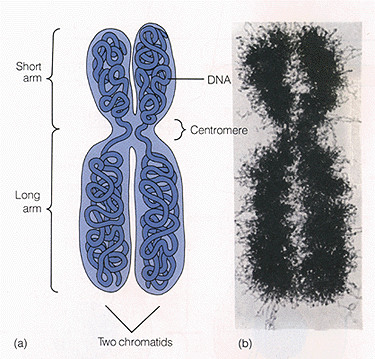
1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 🡪 Spread out when cells are NOT dividing.
2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 🡪 Scrunched up in bundles as when cells divide

**Chromosome structure**

* chromosome armschromosome arms\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 🡪2 identical arms
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 🡪constricted area holds chromatids together
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ PAIR 🡪 2 of each chromosome  
   (one from mom; one from dad)

**Why do chromosomes look like an “X”?**

* When DNA replicates before cell division, chromosomes produce a 2nd, “copied”, chromatid.
* These 2 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ chromosomes appear “X” shaped.
* During Mitosis, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_separate and one goes to each of the two new cells.

****

Biology I Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Article: Cell Reproduction Period: \_\_\_\_ Date: \_\_\_/\_\_\_/\_\_\_

**Directions: Use the following article and your notes to answer the questions. You might have to think a little so don’t be afraid to use your brain!**

In order for organisms to grow, cells must be able to reproduce. There also needs to be a way for organisms to repair damaged tissues. Also, recalling that cells want to maintain a larger surface area to volume ration, when they grow too much they stay small by dividing. In addition, some kinds of living things are able to make clones of themselves in order to increase the population size of their species. For example, amoebas are single-celled organisms and make clones of themselves to create more amoebas; certain plant species do this as well.

There are two types of reproduction—sexual and asexual. Sexual reproduction requires two parents to produce an offspring, whereas **asexual reproduction** is when one parent makes a copy of itself. In asexual reproduction, the offspring are exact genetic copies or clones of the parent. **Mitosis** or mitotic cell division is essentially asexual reproduction of cell, involving cells making a complete copy of their genetic material (DNA). This ensures that when the cell divides into two new daughter cells, each will have a complete copy of the genetic code for their species.

1. Provide three reasons why cells reproduce/divide. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

2. Describe asexual reproduction. How might it differ from sexual reproduction? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

3. How do the daughter cells of asexual reproduction compare to the parent cell genetically? Explain what mitosis is. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Mitotic Cell Division

A cell has a life cycle just like any other living thing. Most of a cell’s life is spent carrying out all of the life processes such as respiration, protein synthesis, digestion etc. This part of the cell’s life is known as **interphase**. At a certain point during interphase, a decision is made to enter into the reproductive process and the cell prepares to divide. When this decision is made, the genetic material has to be copied.

1. Describe interphase and the percentage of a cell’s lifespan it comprises \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Identify the genetic material in cells that must be copied and its location in the cell.  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

As previously discussed, DNA contains the blueprints or instructions for all of the necessary substances such as proteins and all of the life functions. During most of a cell’s life, the DNA is not tightly packed and is referred to as chromatin.

The DNA is spread out in this form in order for protein synthesis to occur more easily (remember DNA must unwind and unzip for the transcription of mRNA to occur). When the cell has “decided” that reproduction must occur, the DNA copies itself. Each strand of DNA makes a copy and the two copies are attached by a structure called a centromere. This process of copying the DNA is replication.

6. What is chromatin? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

7. Define replication. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Biology I Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

HW: Vocabulary Review Period: \_\_\_\_ Date: \_\_\_/\_\_\_/\_\_\_

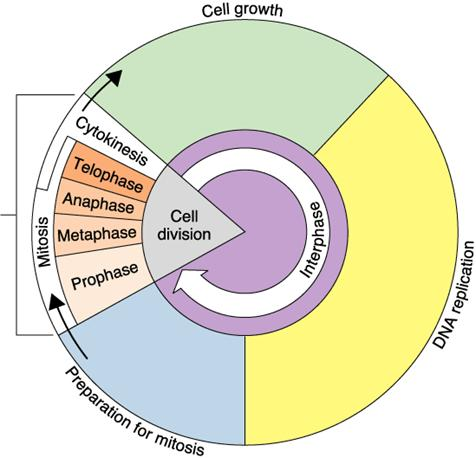
Fill out the right side of the chart with the definition of the corresponding term. Once you have done so, you can fold the paper hotdog style so that the definitions are on the back, then cut along the lines of the chart to create flashcard flaps.

|  |  |
| --- | --- |
| **Chromosome** |  |
| **Asexual Reproduction** |  |
| **Daughter Cell** |  |
| **Chromatin** |  |
| **Mitosis** |  |
| **G1 phase** |  |
| **S phase** |  |
| **G2 phase** |  |

Biology I Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Notes: Mitosis & Cancer Period: \_\_\_\_ Date: \_\_\_/\_\_\_/\_\_\_

**The Cell Cycle**



G1🡪

S🡪

G2🡪

**5 Phases of the Cell Cycle:**

1.

2.

3.

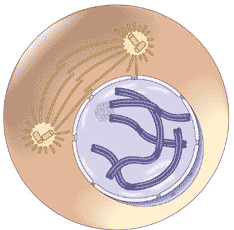
4.

5.

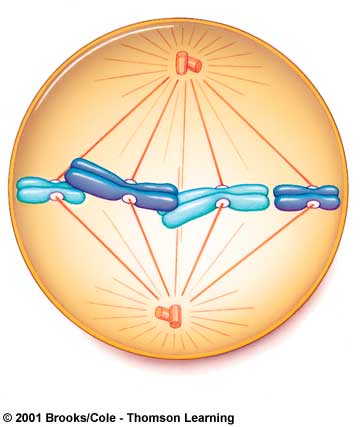
**Interphase**

* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ divisions
* Cells are in this phase most of the time
* See nucleus because DNA is spread out as \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + Can’t see individual chromosomes
* There are three stages of interphase:
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_: Cell growth, Organelles double
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_: DNA replicated and chromosomes duplicated
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_: preparation for mitosis, proteins synthesized

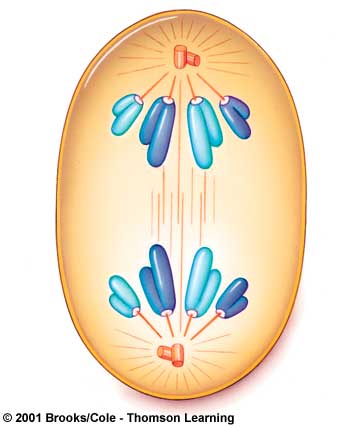
**Mitosis (Cell Division!)**

1. Prophase

* 1st dividing phase
* DNA scrunches into \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_disappears
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_produce spindle fibers

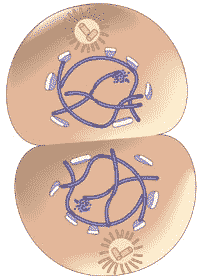
2. Metaphase

* Chromosomes line up in the middle of the cell



3. Anaphase

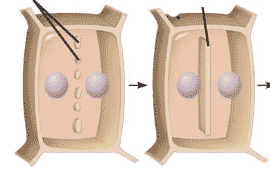
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_pull chromosomes apart
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_chromosomes separate



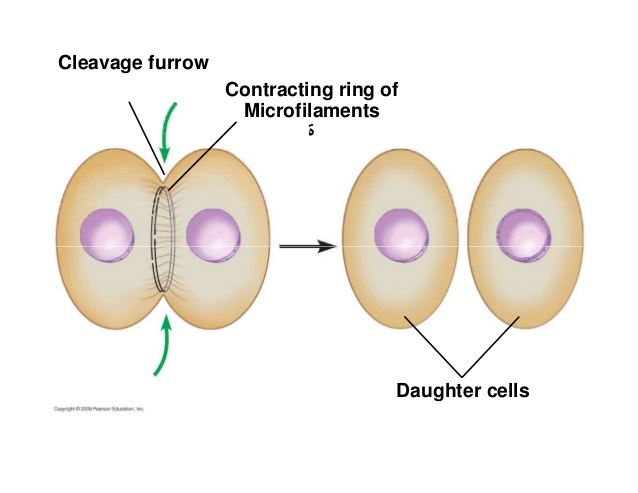
4. Telophase

* See two \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Nuclear \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_returns
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_breaks down
* Chromosomes spread out into \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Cytokinesis

* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_splits into two cells
* Usually happens with telophase
* In Plants:

A \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_is formed.



* In Animals:

A \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_is formed.

Biology I Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Lab: Mitosis Cut & Paste Period: \_\_\_\_ Date: \_\_\_/\_\_\_/\_\_\_

**Objective 9:** Analyze how cells grow and reproduce in terms of interphase, mitosis, and cytokinesis.

**Purpose:**

In this lab, you will demonstrate your understanding of the cell cycle and mitosis by using the chromosomes on the attached page to model various stages of the cell cycle. You will correctly sequence the stages and be able to identify what happens at each stage of the cell cycle.

**Materials:** Colored pencils (3) Glue Scissors

**Procedure:**

1. Using 2 different colors, color the chromosomes. Each homologous pair should be the same color   
   [e.g., all the 1’s should be green (1a & 1b)]
2. The first stage of the cell cycle is interphase, which is broken into three parts. What happens in each of these three parts?
   1. G1: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   2. S: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   3. G2: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. Cut out the chromosomes.
4. Arrange the 4 chromosomes in the boxes below as they would appear during each phase of mitosis.   
   Draw any of the following structures that would be found: cell membrane, nucleus, centrioles, spindle fibers, nuclear envelope.   
   Describe the important parts of each phase.

|  |  |
| --- | --- |
| **Prophase** | Events:  1.  2.  3. |

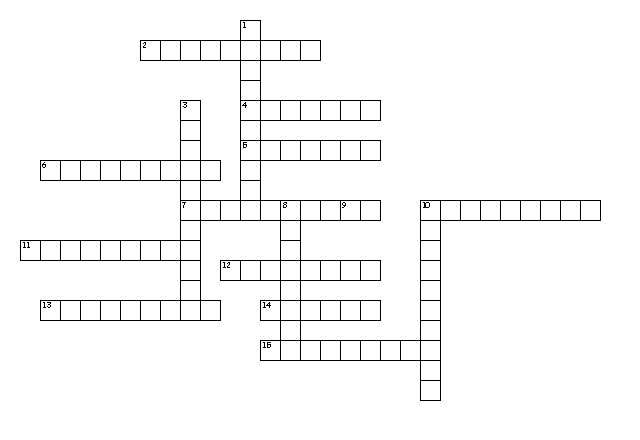
|  |  |
| --- | --- |
| **Metaphase** | Events:  1.    2.  3. |
| **Anaphase** | Events:  1.  2.  3. |
| **Telophase** | Events:  1.  2. |

1. After telophase is complete, the cell undergoes cytokinesis. What happens in the cell during cytokinesis?   
   \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

|  |  |  |
| --- | --- | --- |
|  |  | (Extra) |
|  |  | (Extra) |

|  |  |  |
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|  |  | (Extra) |
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|  |  |  |
|  |  | (Extra) |
|  |  | (Extra) |

**Mitosis Crossword Puzzle**  Name\_\_\_\_\_\_\_\_\_\_\_\_



**Across**

2. – 2nd phase of mitosis when chromosomes line up in the middle of the cell

4. –the process of cell division including division of the nucleus.

5. –helps separate the chromosomes during mitosis. Fan shaped structure made of microtubules.

6. – How most small, water soluble materials get into a cell. process by which molecules tend to move from an area of higher concentration to an area of lower concentration, passive transport

7. – before mitosis, part of the cell cycle when the cell is not dividing but is growing and synthesizing DNA

10. –half of a duplicated chromosome. One of two “sister” parts, makes half of the “X”

11. –organelle made of tiny microtubule structure located in the cytoplasm that helps create the spindle fibers.

12. –when the chromosomes pair separates and moves toward opposite sides, third phase of mitosis.

13. –when the chromosomes uncoil and disperse into a tangle of dense material. The final phase of mitosis.

14. –disorder caused when cells lose the ability to control growth and continue to divide.

15. –series of events cells go through when they divide.

**Down**

1. –Thread like structure with in the nucleus containing genetic information. Made of DNA coiled around proteins.

3. – After Mitosis, division of the cytoplasm and organelles during cell division.

8. – when the chromosomes coil up and become visible, and the centrioles go to opposite sides of the cell, beginning of mitosis

10. –middle of the chromosome, where sister chromatids attach.

Word Bank:

1. Metaphase
2. Mitosis
3. Chromosome
4. Telophase
5. Diffusion
6. Centrioles
7. Cell Cycle (as one word)
8. Centromere
9. Chromatid
10. Interphase
11. Spindle
12. Cancer
13. Prophase
14. Anaphase
15. Cytokinesis

Biology I Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Online Lab: Mitosis Length of Phases Period: \_\_\_\_ Date: \_\_\_/\_\_\_/\_\_\_

**Complete each of the following Modules**

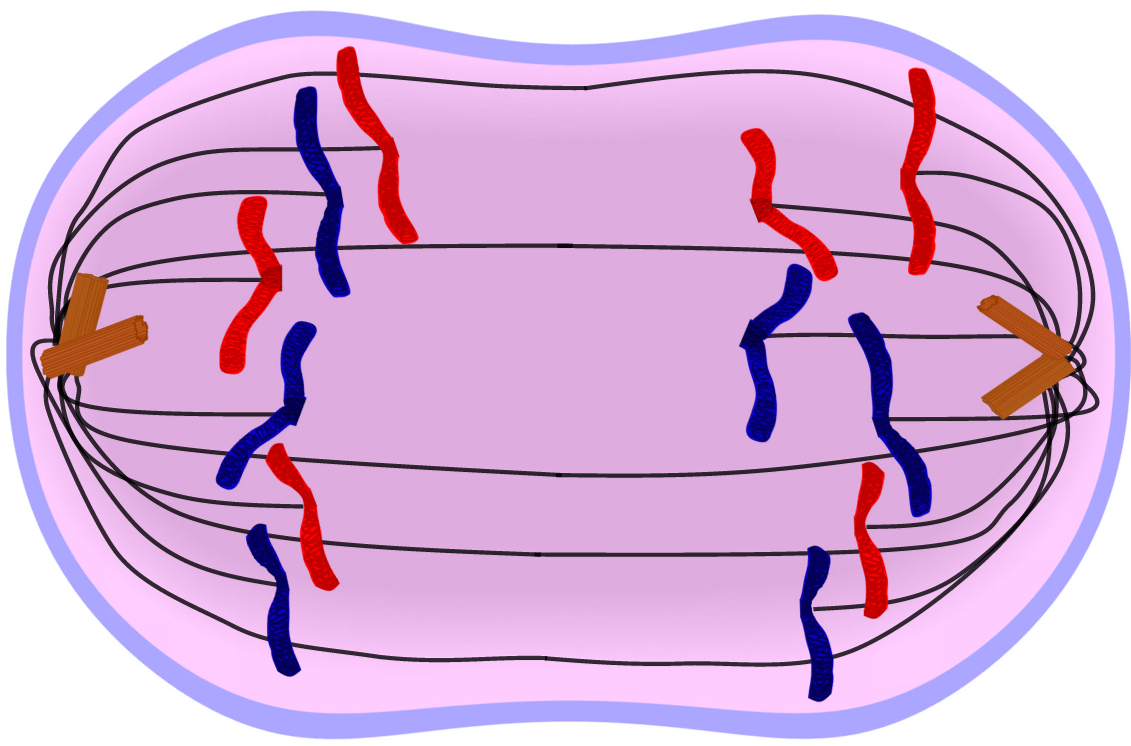
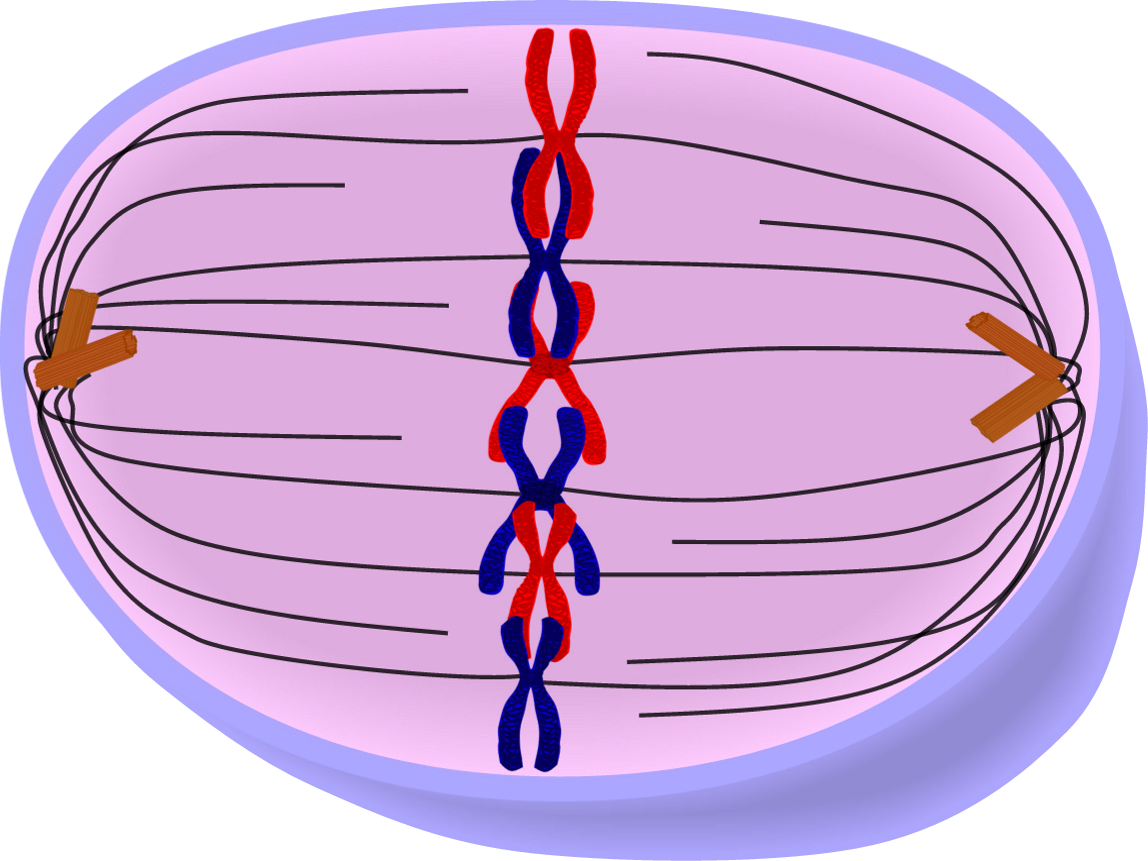
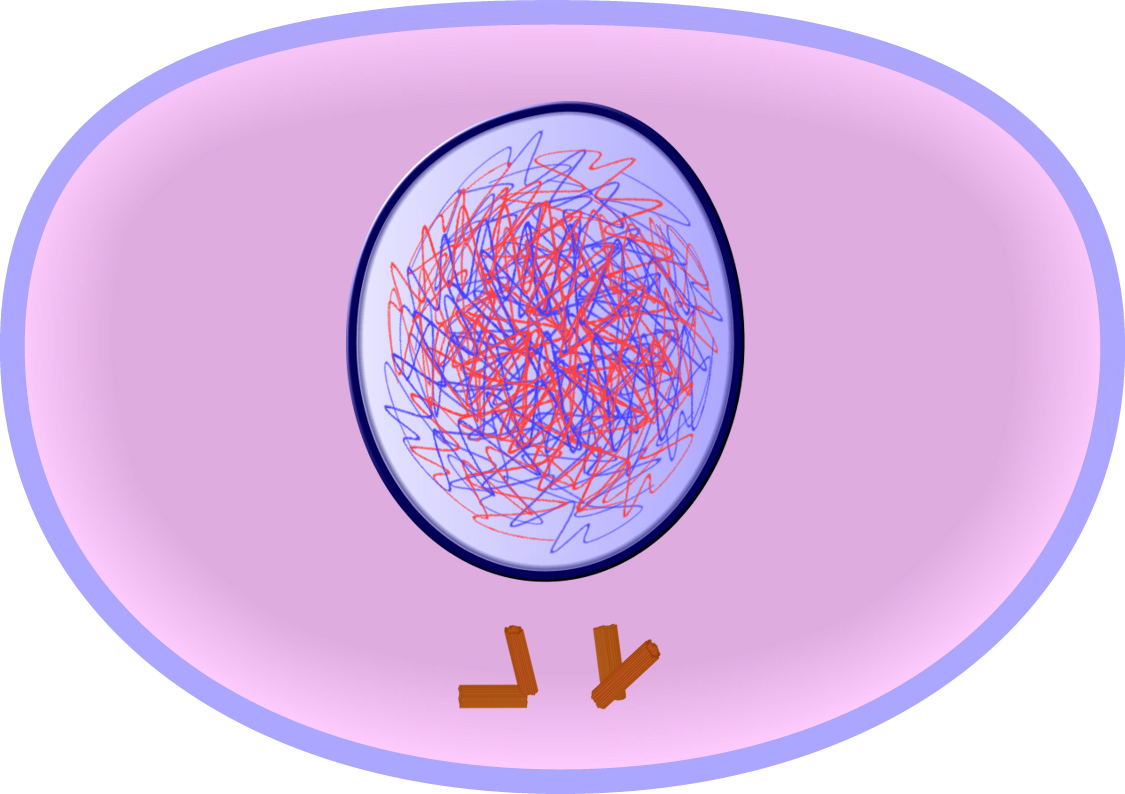
### Module 1: Mitosis Tutorial at <http://www.cellsalive.com/>

On the left side of the screen is a navigation bar, click on the link to “MITOSIS” Read the text on this page and view the animation, you can slow down the video by clicking step by step through the phases.

1. Which stage does the following occur:

|  |  |
| --- | --- |
| Chromatin condenses into chromosomes | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| Chromosomes align in center of cell. | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| Longest part of the cell cycle. | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| Nuclear envelope breaks down. | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| Cell is cleaved into two new daughter cells. | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| Daughter chromosomes arrive at the poles. | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| Chromatids are pulled apart | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

Watch the video carefully.  
  
2. The colored chromosomes represent chromatids. There are two of each color because one is an exact duplicate of the other. -How many chromosomes are visible at the beginning of mitosis? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
  
-- How many are in each daughter cell at the end of mitosis? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
  
--The little green T shaped things on the cell are: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
  
-- What happens to the centrioles during mitosis? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

3. Identify the stages of these cells:

|  |  |
| --- | --- |
|  |  |

### Module 2: Onion Root Tip

Online Activity at [http://www.biology.arizona.edu/cell\_bio/activities/cell\_cycle/cell\_cycle.html](http://www.biology.arizona.edu/cell_bio/activities/cell_cycle/cell_cycle.html" \t "_blank)

Read the introduction, then click the “next” button.  
  
You will have 36 cells to classify. When you’re finished, record your data in the chart below. Round to whole numbers.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Interphase | Prophase | Metaphase | Anaphase | Telophase | Total |
| Number of Cells |  |  |  |  |  |  |
| Percentage of cells (calculate: number of cells divided by total cells x 100) |  |  |  |  |  |  |

In which phase were most of the cells? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

In which phase were the least amount of cells? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Use the data you collected to create a pie chart of how much time cell spend in each phase. Make sure to label your graph and **use color** to indicate each phase.

### Mitosis in Whitefish & Onion Roots

<http://www.biologycorner.com/projects/mitosis.html>. Click on the Whitefish embryo and the onion root tip.

For each organism, identify the stage of mitosis.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | View 1 | View 2 | View 3 | View 4 | View 5 |
| Whitefish |  |  |  |  |  |
| Onion |  |  |  |  |  |

What clues do you use to help you identify which phase each of the cells is in? In other words, how did you know that the cell was in…..

Interphase: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Prophase: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Metaphase: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Anaphase: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Telophase: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_